Best Available Copy

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Office

WIPO

INTERNATIONAL APPLICATION PUBLISHED PER THE PATENT COOPERATION TREATY (PCT)

(51) International patent classification[6]: [cut off] K 9/20

A1

(11) International publication number: WO 96/29993

(43) International publication date: 3 October 1996 (10/3/96)

International application number: PCT/FR96/00470

International filing date: 28 March 1996 (3/28/96)

Priority data:
95/03711 29 March 1995 (3/29/95) FR

Applicant *(for all contracting states except US)*:
MC2 [FR/FR]:
105, rue des Moines, F-75017 Paris (FR)

Inventor; and
Inventor/Applicant *(only for US)*: HESNARD, Xavier
[FR/FR]: 54, rue Victor-Basch, F-94320 Thiais (FR).

Agent: BOUJU DERAMBURE BUGNION: 52, rue de [cut off], F-7500 [cut off] Paris (FR).

[Text cut off]

(81) Contracting states: AL, AM, AU, BB, BG, BR, CA, CN, CZ, EE, GE, HU, IS, JP, KG, KP, KR, LK, LR, LT, LV, MD, MG, MK, MN, MX, NZ, PL, RO, SG, SI, SK, TR, TT, UA, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With International Search Report.
Before expiration of the period allowed for changes to the claims. Publication will be repeated if such changes are received.

(54) Title: SOLID DELIVERY FORM FOR ORAL USE

(57) Abstract [See original for abstract]

PCT ORGANISATION MONDIALE DE LA PROPRIETE INTELLECTUELLE
Bureau international

DEMANDE INTERNATIONALE PUBLIEE EN VERTU DU TRAITE DE COOPERATION EN MATIERE DE BREVETS (PCT)

(51) Classification internationale des brevets 6 : A61K 9/20

A1

(11) Numéro de publication internationale: **WO 96/29993**

(43) Date de publication internationale: 3 octobre 1996 (03.10.96)

(21) Numéro de la demande internationale: PCT/FR96/00470

(22) Date de dépôt international: 28 mars 1996 (28.03.96)

(30) Données relatives à la priorité:
95/03711 29 mars 1995 (29.03.95) FR

(71) Déposant *(pour tous les Etats désignés sauf US)*: MC2 [FR/FR]; 105, rue des Moines, F-75017 Paris (FR).

(72) Inventeur; et
(75) Inventeur/Déposant *(US seulement)*: HESNARD, Xavier [FR/FR]; 54, rue Victor-Basch, F-94320 Thiais (FR).

(74) Mandataire: BOUJU DERAMBURE BUGNION; 52, rue de Monceau, F-75008 Paris (FR).

(81) Etats désignés: AL, AM, AU, BB, BG, BR, CA, CN, CZ, EE, GE, HU, IS, JP, KG, KP, KR, LK, LR, LT, LV, MD, MG, MK, MN, MX, NZ, PL, RO, SG, SI, SK, TR, TT, UA, US, UZ, VN, brevet ARIPO (KE, LS, MW, SD, SZ, UG), brevet eurasien (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), brevet européen (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), brevet OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Publiée
Avec rapport de recherche internationale.
Avant l'expiration du délai prévu pour la modification des revendications, sera republiée si de telles modifications sont reçues.

(54) Title: SOLID DELIVERY FORM FOR ORAL USE

(54) Titre: FORME D'ADMINISTRATION SOLIDE A USAGE ORAL

(57) Abstract

A solid delivery form for placing in the oral cavity to form a controlled-viscosity solution or dispersion having a somewhat syrupy or gel-like consistency. Said delivery form includes, in addition to at least one active principle, an active principle vector that is neutral and stable under standard physiological temperature and pH conditions, and a compound or mixture of compounds which, when contacted with the oral cavity, can form microbubbles for keeping the active principle solubilised or dispersed in said solution or dispersion. Said active principle vector has a colloid structure and lubricates the gut walls while uniformly lining the mucosa and particularly the intestinal villi.

(57) Abrégé

Forme d'administration solide, destinée à former après son introduction dans la cavité buccale une solution ou dispersion à viscosité contrôlée dont la consistance peut rappeler celle d'un sirop ou d'un gel. Cette forme d'administration comprend, outre au moins un principe actif, un vecteur de principe neutre et stable dans des conditions standard de pH et de températures physiologiques et un composé ou un mélange de composés apte à former, au contact de la cavité buccale, des microbulles ayant pour fonction de maintenir solubilisé ou dispersé le principe actif dans ladite solution ou dispersion, ledit vecteur de principe actif présentant une structure de colloïde et ayant pour fonction de lubrifier les parois du transfert intestinal tout en tapissant de façon homogène les muqueuses, et notamment les villosités intestinales.

FOR INFORMATION ONLY

Codes used to identify the states which are parties to the PCT on the cover pages of brochures publishing international applicationby virtue of the PCT.

AT	Armenia
AT	Austria
AU	Australia
BB	Barbados
BE	Belgium
BF	Burkina Faso
BG	Bulgaria
BJ	Benin
BR	Brazil
BY	Belarus
CA	Canada
CF	Central African Republic
CG	Congo
CH	Switzerland
CI	Ivory Coast
CM	Cameroon
CN	China
CS	Czech
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FR	France
GA	Gabon
GB	United Kingdom
GE	Georgia
GN	Guinea
GR	Greece
HU	Hungary
IE	Ireland
IT	Italy
JP	Japan
KE	Kenya
KG	Kirghizistan
KP	Popular Democratic Republic of Korea
KR	Republic of Korea
KZ	Kazakhstan
LI	Liechtenstein
LK	Sri Lanka
LR	Liberia
LT	Lithuania
LU	Luxembourg
LV	Latvia
MC	Monaco
MD	Republic of Moldova
MG	Madagascar
ML	Mali
MN	Mongolia
MR	Mauritania
MW	Malawi
MX	Mexico
NE	Nigeria
NL	Netherlands
NO	Norway
NZ	New Zealand
PL	Poland
PT	Portugal
RO	Rumania
RU	Federation of Russia
SD	Sudan
SE	Sweden
SG	Singapore
SI	Slovenia
SK	Slovakia
SN	Senegal
SZ	Swaziland
TD	Chad
TG	Togo
TJ	Tadjikistan
TT	Trinidad and Tobago
UA	Ukraine
UG	Uganda
US	United States of America
UZ	Uzbekistan
VN	Vietnam

SOLID DELIVERY FORM FOR ORAL USE

The invention relates to a solid delivery form for oral use.

For many years, the galenical pharmacy has been evolving continuously toward increasingly specific and varied pharmaceutical forms.

Thus, if the pharmaceutical forms intended for oral delivery, which is the most commonly used these days, are examined, a listing is compiled of the so-called dry forms represented by the coated and uncoated tablets, the powders, the lyocs, and the so-called liquid forms represented by the solutions, the suspensions, the syrups, the sprays, etc...

A swift challenge emerges from this nonexhaustive description: all these oral forms require a vehicle aiding swallowing: water.

Now, the latter becomes a constraint when its quality is questionable or its physico-chemical characteristics incompatible with the nature or the kinetics of the active principles.

Accordingly, many active principles cannot be packaged in liquid form, because their stability in an aqueous medium is highly precarious or their solubility or dispersion impossible. In addition, these liquid forms often have heavy packaging costs and usage constraints necessitating a calm environment (seepage, leaks, overflow, ...).

The dry forms are more easily movable, but they all depend on a simultaneous swallowing with water. Now, whether it involves tablets and even effervescent forms, the accompanying water volume is never constant. As a matter of fact, there is no international, or even national, standard for the volume of a glass of water...

Nevertheless, the pharmacokinetic study of a very large number of active substances has shown that the effect of the latter was all the more rapid as they reached their absorption site rapidly, with a sufficiently long contact time. As a matter of fact, the major absorption site of the majority of the active principles is located on the mucous membranes of the gastrointestinal segment of the digestive tract. The impact of the physiological variations from one individual to another on the binding capacity of a medicinal substance then is easily understood: meals, hydration, activity, local pathology, ...

Thus, a tablet must undergo, in the first place, its disintegration, its breakdown, its dissolution, then the dispersion or solubilization of the active principle, before the latter can reach its absorption site. In this case, a fraction of the active principle irremediably will not bind and will be eliminated in digestion.

A drinkable solution, a syrup or a suspension has an undeniable advantage: the active principle is dispersed or solubilized immediately and homogeneously. It therefore can bind far more rapidly on the gastrointestinal mucous membrane. Nevertheless, the therapeutic effect of the active principle cannot be perceived until after absorption of the molecules on this mucous membrane. And there again, because of the constant agitation of the gastric and intestinal medium, and the dilution, a fraction of the active principle will be

dispelled in the intestinal medium without having been able to be absorbed.

Finally, oral ingestion of a tablet generally is accompanied by a glass of water prior to its swallowing and the dissolution of the active principle. A few indomitable souls swallow their tablets dry, but the risks of adhesion (ulcer) and the difficulty the tablet has in disintegrating are so many negative points against this method.

Moreover, although the liquid forms integrate the aqueous solvent from the outset, for all that they are not without a few drawbacks: the active principle must withstand its solubilization or its dispersion in the solvent, for the time of this swallowing. And above all, this method of delivery is poorly adapted to an active and busy life. The bottle is fragile and heavy, and there often is a risk that it may spill around the spoon. Furthermore, as in the case of a glass of water, the volume of a spoon is not very standardized, to such an extent that certain laboratories supply the dose spoon.

Another category of liquid form is represented by packaging under pressure or with spraying. But there again, the drawbacks are numerous: incompatibility with certain transportation (air transport), volumes of bulky packaging, complex valve technology, problematic cannula hygiene, high loss in use.

A first object of this invention is to propose a solid delivery form for oral use which overcomes the drawbacks or limits of those found in the state of the art. More particularly, this invention has as its purpose to propose a solid delivery form which, through a specific choice of the compounds constituting it, makes it possible, after its introduction into the oral cavity, to rapidly obtain a

gelled, aqueous, hydrophilic and gaseous solution or dispersion, without the slightest provision of outside water.

Another object of this invention is to propose a solid delivery form making it possible for the active principle to rapidly reach its absorption sites.

Another object of this invention is to propose a solid delivery form having a lubricating effect along the intestinal walls while homogeneously lining the mucous membranes, and in particular the intestinal villi.

Another object of this invention is to propose a solid delivery form which, as soon as it is swallowed, makes it possible for the active principle to reach the gastrointestinal segment far more rapidly and also makes possible far more rapid contacts, and thus transfers, with the endothelial cells of the intestinal villi.

Another object of this invention is to propose a solid delivery form which makes it possible for the active principle to reach its absorption site in a more continuous manner, and thus to avoid a saturating effect on the specific receptors.

Another object of this invention is to propose an oral delivery form which, after its introduction into the oral cavity, has a viscosity such that it makes it possible to contemplate treatments by perlingual means.

Another object of this invention is to propose a solid delivery form which, after its introduction into the oral cavity, generates an overpressure which is transformed into a gas flow subsequently

invading the otorhinolaryngeal sphere and the bronchial tubes, making it possible for the pharmaceutical substances to reach the mucous membranes of the upper and lower air passages.

Another object of this invention is to propose a solid delivery form which advantageously makes it possible to replace the syrup, gel and pump or spray forms, while appreciably improving the contact and absorption of the active substances with the gastrointestinal mucous membranes and the mucous membranes of the bronchial tubes and the otorhinolaryngeal sphere.

To this end, the invention relates to a solid delivery form for oral use comprising, in addition to at least one active principle:

- an active principle vehicle that is neutral and stable under standard physiological pH and temperature conditions; and
- a compound or a mixture of compounds capable of forming, in contact with the oral cavity, microbubbles serving to solubilize or disperse the active principle in the said solution or dispersion;

characterized in that in combination,

- the active principle vehicle has a colloidal structure, serving to lubricate the inner walls of the digestive tract and to keep the active principle solubilized or dispersed, while homogeneously lining the mucous membranes, and in particular the intestinal villi; and
- the delivery form does not comprise any water and does not require the addition of outside water,

so that it rapidly forms, after its introduction into the oral cavity, a solution or dispersion with a controlled viscosity the consistency of which is close to that of a syrup or of a gel.

This combination offers as advantages in particular the syrupy or gelled aspect of the solution, hence the lubricating effect; and the

low gas release, hence the maintenance over time of the solubilization or dispersion of the active principle in the solution.

In addition, this combination offers a practical advantage: it makes it possible to replace the spoonful of syrup or any other liquid form with a dry, solid delivery form, optimized by the search for a controlled viscosity.

The invention therefore offers the combined advantages of a solid form - absence of water, precision of dosage, easy use and packaging - and of a liquid form with controlled viscosity - more rapid availability of the active principle or principles on the absorption sites of the digestive tract.

The active principle vehicle is present in the solid delivery form according to the invention, in a quantity making it possible to achieve a viscosity of the gelled dispersion solution ranging between 20 and 4,000 mPa.s or more.

The solid delivery form according to this invention comprises a minimum on the order of 0.5% and up to 50% or more of active principle vehicle per ingestion, according to the galenical form chosen.

The active principle vehicle is chosen from among the thickening agents and/or gelling agents and/or binders making it possible for it to be used as such for the manufacture of the delivery form. The active principle vehicle preferably is chosen from within the group made up of the cellulosic derivatives and in particular carboxymethylcellulose, hydroxypropylmethylcellulose, hydroxypropyl-cellulose, methylcellulose or equivalent.

The compound or the mixture of compounds capable of forming microbubbles is present in a given quantity in such a way that it releases, when it is in contact with the oral cavity, a gas volume ranging between 1 and 100 cm^3. This compound or mixture of compounds capable of forming microbubbles comprises in particular a filler which is chemically inert with respect to the active principle vehicle. This filler agent is chosen from within the group made up of the alkaline or alkaline-earth metal carbonates or bicarbonates, or physiologically acceptable equivalents. This may be, more particularly, calcium carbonate, sodium bicarbonate, monosodium carbonate or glycine carbonate.

The compound or the mixture of compounds capable of forming microbubbles is chosen from within the group made up of the acids, the acid anhydrides and the physiologically acceptable acid salts. More particularly, the said compound or the said mixture of compounds is chosen from within the group made up of citric acid, tartaric acids, ascorbic acid, fumaric acid, nicotinic acid, acetylsalicylic acid, malic acid, adipic acid, succinic acid, glutaric anhydride and citric anhydride.

The ratio by weight between the active principle vehicle and the compound or the mixture of compounds capable of forming the microbubbles ranges between 0.5% and 50% or more depending on the galenical form chosen.

According to the invention, the solid delivery form is offered in the form of a tablet, a granule, a powder or any other dry form for oral ingestion.

The invention also relates to a solid delivery form comprising in combination all or part of the characteristics mentioned above or described hereinafter.

Other characteristics and advantages of the invention will become apparent upon reading of the description which follows and the examples given on a non-restrictive basis referring to preferential embodiments of the invention.

The invention therefore relates to a solid delivery form which is suitable for a simple oral ingestion, without a provision of outside water. Its disintegration time in the mouth is variable, depending on whether it is sucked or chewed. It results in the formation of a gelled mass, syrupy or fluid depending on the viscosity sought. This more or less viscous and hydrophilic swallowing lines the gastrointestinal walls all along their course, thus promoting exchanges with the mucous membranes.

The invention consists in a specific selection of excipients which make it possible, after introduction of the powder, the granules or the tablet into the oral cavity, to rapidly obtain a gelled, aqueous, hydrophilic and gaseous solution or dispersion, without the slightest provision of outside water.

This new formulation is as suited to tablets as it is to powders or granules.

The delivery form of the invention comprises an excipient responsible for the viscous nature and an excipient responsible for the gas release.

The viscosity and the gas release can be adapted to the kinetics of the active principles carried, which gives a very extensive field of application to the dry pharmaceutical form so obtained.

Thus a low or medium viscosity and a minor gas release will make it possible for the active principles to rapidly reach their absorption site; because in fact if the excipient responsible for the viscous nature of the solution or of the dispersion is in low proportion, it nevertheless ensures, at any concentration, a lubricating effect along the intestinal walls, the solubilized or dispersed state of the active principle, the mitigation of the organoleptic shortcomings of the active principles, while homogeneously lining the mucous membranes, and in particular the intestinal villi. Therefore, as soon as it is swallowed, the mixture obtained reaches the gastrointestinal segment (lubricating effect) far more rapidly and also makes possible far more rapid contacts and therefore transfers with the endothelial cells of the intestinal villi (gel effect). At the same time, the low gas release makes it possible to slightly distend the gastric walls and thus to accelerate the peristalsis of the stomach.

A greater viscosity makes it possible for the colloidal substrate to move far more slowly on the gastrointestinal segment, while releasing the active principles in a continuous manner in the intestinal lumen. It thus provides the pharmaceutical form with a so-called therapeutic-action maintenance effect. It makes it possible for the active principle to reach its absorption site in a more continuous manner and thus to avoid a saturating effect on its specific receptors. Active principles coated with gastro-resistant substances may be used conjunctively.

A high viscosity also may be useful starting right from the oral cavity for better distribution and to better line the mucous membranes of the upper digestive tract, in particular in the treatment of stomatitis, pharyngitis, tonsillitis, mouth ulcers, oral lesions and in general all local infections of the oropharynx.

A high viscosity also makes it possible to contemplate treatments by perlingual means (trinitrine for example). The gel so obtained adheres to the mucous membrane making it possible for the active principle to better diffuse and reach the general circulation.

The solid delivery form according to the invention also makes possible a nontoxic gas release (carbon dioxide) the volume of which varies between 1 and 100 cm^3 depending on the proportions of excipients. There thus is obtained an oral overpressure which is transformed into a gas flow. The latter then invades the otorhinolaryngeal sphere and the bronchial tubes, making it possible for the pharmaceutical substances to reach the upper and lower air passages. The delivery form of the invention therefore could integrate the same active substances which are found in pump, spray or inhalation forms.

The delivery form according to the invention comprises, in addition to at least one active principle, an active principle vehicle and a compound or a mixture of compounds capable of forming microbubbles in contact with the oral cavity. It does not comprise any water and does not require any addition of water or other outside liquid.

In a preferred embodiment, the active principle vehicle consists of a derivative of cellulose - generally used for

thickening, placing in suspension, stabilizing, gelling of modifying the flow or adhesion characteristics - and the compound or mixture of compounds capable of forming microbubbles consists of an effervescent pair - used as a homogenizing mixer.

Although the description which follows will be presented essentially with reference to these compounds, it should be understood that the invention is not to be limited to these compounds. Any compound having the same function and the same result falls within the context of the invention.

The invention consists in a judiciously calculated mixture of a cellulose derivative and an effervescent pair. Depending on the form sought, tablet or powder, the other excipients such as binders, lubricants, flavorings, will be chosen according to the expected result.

The cellulose derivative which was used in the course of the various tests, and which yielded the best results, is carboxymethylcellulose (commonly called CMC).

The latter offers the following advantages:

It dissolves rapidly in cold or warm water.

It forms solutions with a neutral pH.

The stability of its solutions is very good in the pH zones ranging between 1 and 12.

The chemical experiments showed that its oral delivery is devoid of any physiological risk.

As a neutral colloid is involved, this compound has no unfavorable effect on healthy or diseased mucous membranes.

Because of its colloidal structure, this product is an excellent thickening agent, a good rheological regulator, a good stabilizer and a good suspension agent.

Furthermore, depending on the type of CMC used and its concentration in the pharmaceutical form, solutions of very low (close to water) or very high (gel) viscosity are obtained.

Unlike other soluble polymers, CMC does not foam.

CMC, in solution in water or in dry form, possesses a recognized binding capacity which makes it possible to use it for the manufacture of powders, granules or tablets.

CMC also may be regarded as a dietary fiber. Moreover, the human system has no enzymatic reaction allowing hydrolysis of this fiber and therefore its absorption.

Finally, CMC is a compound which is used in the context of the invention as a gelling agent with viscosity adjustable over a wide range, a lubricant at any concentration, an active principle vehicle which is neutral and stable under all physiological pH and temperature conditions. This product therefore is fully suited to optimal use as a vehicle, and under all physiological conditions of the individual and of the active principles, and to their protection on the gastrointestinal path.

It also makes it possible to keep the substances soluble and dispersed in contact with the gastrointestinal mucous membrane and therefore to promote the absorption thereof.

Finally, its mechanical properties make it possible for it to be used as the one and only binder for the manufacture of tablets and powders.

The effervescent pair which is added thereto makes it possible to offset the pasty feelings of the gel developing in the mouth through the formation of molecules of water intrinsic to the effervescence reaction. In fact, the effervescence reaction, already known for a long time, has the distinctive feature of producing molecules of water which thus mitigate the high water-retention capacity of the CMC.

Moreover, the carbonate or carbonates used makes/make it possible, through the filler which it/they represent, to increased the viscosity without all the while increasing the proportions of CMC.

Finally, this effervescence reaction makes it possible to keep the active substances solubilized or dispersed within the gel, by virtue of the formation of microbubbles. The latter also make it possible to increase the exchange surface with the gastrointestinal mucous membranes.

Another as yet unused effect of this formulation is the gas release which produces in the mouth an overpressure which will be all the greater as the concentration of effervescent agents is higher. On the other hand, this gas release absolutely is not linked to the presence of the cellulosic derivative which, if

need be, can be absent, if only an effect of the active principle on the mucous membranes of the air passages is sought.

Certain tests described hereinbelow were performed according to the attached tablet formulas described hereinbelow.

The demonstration equipment, very simple, is composed of a glass decanting vial and, in its lower portion, a tap of the same material.

The various experiments consisted in filling the vial, through its upper portion, with the hydrated powdery mixtures and observing the behavior thereof on the inner surface with or without water immersion.

The lower portion made it possible to observe the residues which were deposited therein.

At the beginning, there was prepared a powdery mixture composed of:

Citric acid	400 mg
Calcium carbonate	350 mg
Carboxymethylcellulose	200 mg
Drinking water	1 mg

The whole was mixed in a small glass beaker with the aid of a glass manual stirrer, and immediately deposited on the moist inner surfaces of the vial with this same stirrer. The vial then was closed with a ground-glass stopper. This entire operation took approximately 20 seconds.

The viscosity of the solution so obtained seems very high. A vigorous stirring is not sufficient to accelerate the descent of the gel into the lower portion of the vial. In transparency this gel appears translucent, milky and composed of small air bubbles. At the end of 30 minutes, a portion of the gel seems to be accumulated in the lower portion of the vial in the vicinity of the emptying tap. Nonetheless, a portion, 20 to 30% of the gel, still covers the inside surface of the vial.

After opening of the emptying tap, a slight gas overpressure escapes.

The same experiment is repeated with 1 mg of methylene blue added to the powdery mixture, and filling of the vial with 3/4 drinking water (after the depositing of the gel on the inner surface of the vial).

Immediately after the filling of the vial, bluish trickles escape from the gelled masses.

After 1/4 hour, the water in the vial is uniformly blue.

After 1/2 hour, the vial is emptied of all the water which it contains and is filled again with the same volume of water. A slight gas release accompanies the emptying.

Bluish gelled masses still cover the inner surface, while others have started to detach, accumulate and dissolve in the bottom of the vial.

The water again turns blue, but with a lesser intensity. The second emptying is performed 1/2 hour after the first. The

solution which escapes therefrom is very pale blue, with no gas release.

No trace of gel remains on the inner surface of the vial.

This small experiment makes it possible to confirm that the CMC in a high proportion (100, 200 mg or more per ingestion) in the powdery mixture makes it possible to obtain a gel which is highly viscous but which gradually releases, through its solubilization, the substances which it contains.

If the experiment is repeated under the same conditions as before, but with only 50 mg of carboxymethylcellulose and without filling the vial with water, it is noted that the gelled mass descends very quickly (2 to 5 seconds) along the inner surface, leaving in its path bluish traces which rapidly disappear.

Flooding the vial with drinking water makes it possible to obtain an immediate homogeneous blue solution. Its emptying, after 1/2 hour, reveals no trace or gelled deposits on the inner surface, but still allows a slight gas leak to escape.

This second series of experiments makes it possible to confirm that the CMC, at low concentration in the pharmaceutical form, has no delaying effect on the release of the substances which it contains. On the other hand, it makes possible, by virtue of its structure, a closer contact with its medium. It then may be thought that it appreciably improves the absorption of the substances which it transports, by lining the mucous membranes which it covers on its path more amply than water.

The last series of experiments was performed with a view to evaluating the volume of gas (in this instance CO2) released by the effervescence reaction.

Tablets were manufactured with the same quantities of effervescent agents as in the preceding experiments. They then were coarsely ground in a mortar in 4 or 5 aggregates and rapidly placed under a test tube graduated to 100 cm^3, filled with water and inverted.

At the end of 10 minutes, the pieces of tablets were completely dissolved and the volume of CO2 resulting from the effervescence could be read.

This volume, over about ten tablets, was between 35 and 42 cm^3 per tablet.

It therefore easily may be deduced therefrom that only the proportions and the quantities of effervescence excipients are linked to the volume of CO2 released, with or without carboxymethylcellulose.

The delaying effect of the CMCs therefore is proportional to their concentration in the pharmaceutical form and thus to the viscosity which they create.

Their tendency to line the mucous membrane seem to be revealed for quantities approaching 50 mg per ingestion.

The volume of carbon dioxide released is proportional to the quantities of effervescent agents used and independent of the presence of CMC.

The invention now will be illustrated, on a nonrestrictive basis, by the following examples:

Example 1: for a placebo tablet with a pseudo-syrup effect

Composition:	
Carboxymethylcellulose	200 mg
Calcium carbonate	500 mg
Citric acid	600 mg
Polyvinylpyrrolidone	100 mg
Aspartame	20 mg
Magnesium stearate	50 mg
Lactose	490 mg
Orange flavoring	40 mg
TOTAL	2,000 mg

Example 2: composition

Calcium carbonate	1,250 mg
Citric acid	660 mg
Polyvinylpyrrolidone	60 mg
Aspartame	20 mg
Magnesium stearate	50 mg
Sorbitol	40 mg
Carboxymethylcellulose	80 mg
Orange flavoring	40 mg
TOTAL	2,000 mg

Example 3: composition

Coated aspirin (RP)	516 mg
Calcium carbonate	500 mg
Citric acid powder	500 mg
Polyvinylpyrrolidone	100 mg
Aspartame	10 mg
Magnesium stearate	50 mg
Lactose	144 mg
Carboxymethylcellulose	40 mg
Lemon-vanilla flavoring	40 mg
TOTAL	2,000 mg

Example 4: composition

Ascorbic acid	500 mg
Calcium carbonate	500 mg
Citric acid	100 mg
Polyvinylpyrrolidone	50 mg
Aspartame	20 mg
Magnesium stearate	50 mg
Sorbitol	620 mg
Carboxymethylcellulose	120 mg
Orange flavoring	40 mg
TOTAL	2,000 mg

Example 5: composition:

Terpine hydrate	50 mg
Base codeine	1 mg
Benzoic acid	80 mg
Calcium carbonate	500 mg
Citric acid	600 mg
Polyvinylpyrrolidone	100 mg
Aspartame	10 mg
Magnesium stearate	50 mg
Lactose	184 mg
Carboxymethylcellulose	150 mg
Lemon-vanilla flavoring	40 mg
TOTAL	1,765 mg

Example 6: composition

Coated paracetamol (RP)	529 mg
Calcium carbonate	500 mg
Citric acid powder	587 mg
Polyvinylpyrrolidone	100 mg
Aspartame	20 mg
Magnesium stearate	50 mg
Lactose	134 mg
Carboxymethylcellulose	40 mg
Exotic fruit flavoring	40 mg
TOTAL	2,000 mg

Example 7: composition

Ibuprofen	0.1425 g
Calcium carbonate	0.1425 g
Citric acid powder	0.1710 g
PEG 6000	0.0171 g
Aspartame	0.0114 g
Magnesium stearate	0.0143 g
Lactose	0.0263 g
Carboxymethylcellulose	0.0260 g
Gum	0.0085 g
Lemon flavoring	0.0114 g
TOTAL	0.5700 g

CLAIMS

1. A solid delivery form for oral use comprising, in addition to at least one active principle:

- an active principle vehicle that is neutral and stable under standard physiological pH and temperature conditions; and
- a compound or a mixture of compounds capable of forming, in contact with the oral cavity, microbubbles serving to solubilize or disperse the active principle in the said solution or dispersion;

characterized in that in combination,

- the active principle vehicle has a colloidal structure, serving to lubricate the inner walls of the digestive tract and to keep the active principle solubilized or dispersed, while homogeneously lining the mucous membranes, and in particular the intestinal villi; and
- the delivery form does not comprise any water and does not require the addition of outside water,

so that it rapidly forms, after its introduction into the oral cavity, a solution or dispersion with a controlled viscosity the consistency of which is close to that of a syrup or of a gel.

2. A solid delivery form according to claim 1, characterized in that the active principle vehicle is present therein in a quantity making it possible to achieve a viscosity of the gelled solution or dispersion ranging between 20 and 4,000 mPa.s or more.

3. A solid delivery form according to claim 1 or 2, characterized in that it comprises at minimum on the order of 0.50% of active principle vehicle per ingestion.

4. A solid delivery form according to any one of claims 1 to 3, characterized in that it comprises up to 50% or more of active principle vehicle per ingestion.

5. A solid delivery form according to any one of claims 1 to 4, characterized in that the active principle vehicle is chosen from among the thickening agents and or gelling agents and or binders making it possible for it to be used as such for the manufacture of the delivery form.

6. A solid delivery form according to claim 5, characterized in that the active principle vehicle is chosen from within the group made up of the cellulosic derivatives and in particular carboxymethylcellulose, hydroxypropylmethyl-cellulose, hydroxypropylcellulose, methylcellulose or equivalents.

7. A solid delivery form according to any one of claims 1 to 6, characterized in that the compound or the mixture of compounds capable of forming microbubbles is present in a given quantity in such a way that it releases, when it is in contact with the oral cavity, a gas volume ranging between 1 and 100 cm^3.

8. A solid delivery form according to any one of claims 1 to 7, characterized in that the compound or the mixture of compounds capable of forming microbubbles comprises in particular a filler which is chemically inert with respect to the active principle vehicle.

9. A solid delivery form according to claim 8, characterized in that the filler agent is chosen from within the group made up of the alkaline or alkaline-earth or bivalent metal

carbonates or bicarbonates, or physiologically acceptable equivalents.

10. A solid delivery form according to any one of claims 1 to 9, characterized in that the compound or the mixture of compounds capable of forming microbubbles is chosen from within the group made up of the acids, the acid anhydrides and the physiologically acceptable acid salts.

11. A solid delivery form according to claim 10, characterized in that the compound or the mixture of compounds is chosen from within the group made up of citric acid, tartaric acid, ascorbic acid, fumaric acid, nicotinic acid, acetylsalicylic acid, malic acid, adipic acid, succinic acid, glutaric anhydride and citric anhydride.

12. A solid delivery form according to any one of claims 1 to 11, characterized in that the ratio by weight between the active principle vehicle and the compound or the mixture of compounds capable of forming microbubbles ranges between 0.5 and 50% or more.

13. A solid delivery form according to any one of claims 1 to 12, characterized in that it is offered in the form of a tablet, a granule, a powder or any other dry form for oral ingestion.

14. The use of a solid delivery form according to any one of claims 1 to 13 as a replacement for a syrup or a gel.

15. The use of a solid delivery form according to any one of claims 1 to 13 as a replacement for a pump, a sprayer or an inhaler.

16. The use according to claim 15, for which the solid delivery form comprises, in addition to an active principle, a compound or a mixture of compounds capable of forming microbubbles in contact with the oral cavity.

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☑ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☑ FADED TEXT OR DRAWING
- ☑ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☑ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☑ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.